



# Project Summary

US Army Engineer  
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Waterways Experiment Station

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## **Analysis of Reinforced Revetment Slope of Sargent Beach Erosion Protection Project on the Gulf Intracoastal Waterway**

**Introduction:** The Gulf Intracoastal Waterway (GIWW) is located along the Gulf of Mexico and serves as a passage way for barge and ship traffic which carry goods to and from ports located along the Texas coastline. Natural land barriers protect this traffic from wave action in the Gulf of Mexico. Erosion is a particular problem faced by the Galveston District in maintaining the waterway. In a particular segment near Sargent Beach, the width of the land barrier has decreased to between 600 and 900 ft with the erosion rate being between 25 and 36 ft per year. Thus, the CESWL is involved in the design and construction of a barrier to check the advancement of erosion across the land barrier. A sheetpile wall will serve as the barrier along most of the 8-mile alignment. However, in one particular segment of the project where the foundation soils are very soft, a cost analysis showed a potential for significant savings if the costly sheetpile wall was replaced with revetment blocks placed on an excavated slope reinforced with geosynthetic material.

**Approach:** Finite element and stability analyses were performed by the U.S. Army Engineer Waterways Experiment Station and the Galveston District to aid in the design of a reinforced slope faced with concrete revetment blocks. The finite element method was used to simulate the construction process and predict the behavior at different stages of construction. Excavation, filling, and placement of geosynthetic reinforcement were the construction processes modeled. The principle objectives of the study were to use the analyses to gain insight toward evaluating whether or not the predicted behavior of the slope would meet the project's stability requirements. The direction and magnitude of foundation movements were estimated from the finite element calculations. The effect of reinforcement stiffness on the slope's predicted performance was also evaluated and was used by district designers in the selection of an appropriate reinforcing material.

**Results:** The results showed that the reinforced slope alternative was technically possible and met project requirements. The reinforced slope alternative was included as an option in the bidding documents. Based on the difference between the contractor's estimates of the costs of the sheetpile wall and reinforced slope designs the savings will be \$455,000. The Sargent Beach Project is currently under construction and will incorporate the reinforced slope alternative in the reach having the soft foundation soils. The Waterways Experiment Station is currently in the process of publishing a Miscellaneous Paper documenting the investigation.

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